Observations and Models of the Fast and Slow Solar Wind

E. Marsch
Max-Planck-Institut für Aeronomie
D-37191 Katlenburg-Lindau, Germany

There are two major types of solar wind. The steady fast wind originates on open magnetic field lines in coronal holes, which may last for many solar rotations. In contrast, the unsteady slow wind is coming from the bulk or boundary layer of streamers, which are mostly magnetically closed and open up only temporarily. Many observations of the solar wind have in the past been made, e.g., in situ by Helios and Ulysses and remotely by SOHO. Correspondingly, many models for the fast and slow wind have been developed to different levels of sophistication. The majority of the models is concerned with the fast wind. Essential properties of fast streams can be reproduced by 1-D multi-fluid models involving broad-band waves. Yet, the integration of the fluid equations must start low in the corona in the magnetic funnels at transition region level. Also, 3-D MHD models have recently been developed. Owing to its time-variable nature, no robust understanding of the slow wind exist. Apparently, its acceleration starts only beyond two solar radii. Key empirical constraints, which are imposed on the models by the Helios (near-Sun, in-ecliptic) and Ulysses (high-latitude) interplanetary measurements and by the SOHO plasma-spectroscopy results, are discussed with respect to the fluid as well as kinetic properties of the wind. Selected results from modelling and observations are presented and discussed.